

WHAT IS CLAIMED IS:

1 1. An isolated nucleic acid comprising a nucleotide sequence that is
2 greater than 80% identical to the nucleotide sequence GCCTCTGGGGAG (SEQ ID
3 NO:1)

1 2. An isolated nucleic acid according to claim 1, wherein the
2 nucleotide sequence is GCCTCTGGGGAG (SEQ ID NO:1).

1 3. An isolated nucleic acid according to claim 1, further comprising a
2 nucleotide sequence that binds an Sp-1 transcription factor protein.

1 4. An isolated nucleic acid according to claim 3, wherein the
2 nucleotide sequence is AGGTGGGACT (SEQ ID NO:2).

1 5. An isolated nucleic acid according to claim 1, further comprising
2 an S1 nuclease sensitive site.

1 6. An isolated nucleic acid according to claim 5, wherein the S1
2 nuclease sensitive site is about 20 repeats of a sequence CCTT.

1 7. An isolated nucleic acid according to claim 3, further comprising
2 an S1 nuclease sensitive site.

1 8. An isolated nucleic acid according to claim 7, wherein the S1
2 nuclease sensitive site is about 20 repeats of a sequence CCTT.

1 9. An isolated nucleic acid comprising a nucleotide sequence
2 AGGTGGGACT (SEQ ID NO:2), which is 5' to a nucleotide sequence

GCCTCTGGGGAG (SEQ ID NO:1), which is 5' to about 20 repeats of a sequence CCTT.

10. An isolated nucleic acid according to claim 9, having a nucleotide sequence as depicted in Figure 6A (SEQ ID NO:3).

11. An isolated nucleic acid according to claim 9, wherein the nucleic acid sequences are approximately 7 kb genomic nucleic acid upstream of a β_3 -AR transcription initiation site.

12. An isolated nucleic acid according to claim 5, further comprising a gene operatively associated with a promoter, wherein the gene and promoter are downstream of the *trans*-activator binding site and the S1 nuclease sensitive site.

13. An isolated nucleic acid according to claim 12, further comprising a nucleotide sequence that binds an Sp-1 transcription factor protein.

14. An isolated nucleic acid according to claim 9, further comprising a gene operatively associated with a promoter, wherein the gene and promoter are downstream of the AGGTGGGACT (SEQ ID NO:2) sequence, the GCCTCTGGGGAG (SEQ ID NO:1) sequence, and the repeats of the sequence CCTT.

15. An isolated nucleic acid according to claim 12, wherein the promoter is a herpes simplex virus thymidine kinase minimum promoter.

16. An isolated nucleic acid according to claim 12, wherein the promoter is a β_3 -adrenergic receptor (β_3 -AR) promoter.

1 17. An isolated nucleic acid according to claim 12, wherein the gene is
2 a reporter gene.

1 18. An isolated nucleic acid according to claim 16, wherein the gene is
2 a reporter gene.

1 19. A cell line containing the isolated nucleic acid according to claim
2 12.

1 20. A cell line containing the isolated nucleic acid according to claim
2 14.

1 21. A nucleic acid that hybridizes under conditions of high stringency
2 with the nucleic acid according to claim 2.

1 22. A β_3 -AR *trans*-activating factor polypeptide, wherein said
2 polypeptide has the following characteristics:

3 (a) it binds specifically to the nucleic acid according to claim 2;

4 (b) it is expressed by brown adipose tissue cells;

5 (c) it is expressed at very low levels by cells isolated from the
6 perirenal depot;

7 (d) an AP-2 binding nucleic acid does not compete with a nucleic acid
8 comprising a nucleotide sequence GCCTCTGGGGAG (SEQ ID NO:1) for
9 binding the polypeptide; and,

10 (e) when complexed to a nucleic acid comprising SEQ ID
11 NO:1, it is not recognized by an antibody to AP-2.

1 23. A method of isolating a polypeptide that binds specifically to a
2 nucleic acid having a nucleotide sequence GCCTCTGGGGAG (SEQ ID NO:1), which
3 method comprises:

4 (a) contacting a composition suspected of containing the polypeptide
5 with the nucleic acid under conditions that permit detection of binding of the
6 polypeptide to the nucleic acid; and

7 (b) isolating the bound polypeptide.

1 24. A method according to claim 23, wherein the composition is a
2 yeast hybrid assay system recombinantly engineered to express polypeptides from cells
3 that express β_3 -AR.

1 25. A method according to claim 24, wherein the cells are selected
2 from the group consisting of human brown adipose tissue cells, human neuroblastoma
3 cells, and HIB cells.

1 26. A method according to claim 23, wherein the composition is a
2 nuclear extract from cells that endogenously express β_3 -AR.

1 27. A method according to claim 26, wherein the cells are selected
2 from the group consisting of human brown adipose tissue cells, human neuroblastoma
3 cells, and HIB cells.

1 28. A method of screening for a compound that increases activity of a
2 β_3 -AR *trans*-activating factor in human cells, which method comprises:

3 (a) contacting cells capable of producing the β_3 -AR
4 *trans*-activating factor with a test compound; and

5 (b) detecting an increase in a level of activity of the β_3 -AR
6 *trans*-activating factor.

1 29. A method according to claim 28, wherein the increase in the level
2 of activity of the β_3 -AR *trans*-activating factor is detected by detecting an increase in the
3 level of expression of a reporter gene operatively associated with an isolated nucleic acid
4 having a nucleotide sequence GCCTCTGGGGAG (SEQ ID NO:1) relative to a level of
5 expression prior to contact with the test compound.

1 30. A method according to claim 29, wherein the increase in the level
2 of activity of the β_3 -AR *trans*-activating factor is detected by detecting an increase in the
3 amount of β_3 -AR *trans*-activating factor present in the cells after contacting them with
4 the test compound relative to the amount present prior to contact with the test compound.

1 31. A method according to claim 28, wherein the cells do not
2 endogenously express, or express at very low level, β_3 -AR.

1 32. A method according to claim 31, wherein the cells are selected
2 from the group consisting of HeLa cells, CV-1 cells, and WAT cells.

1 33. A method of screening for a compound that inhibits activity of a
2 β_3 -AR *trans*-activating factor in human cells, which method comprises:

- 3 (a) contacting cells capable of producing the β_3 -AR
4 *trans*-activating factor with a test compound; and
5 (b) detecting a decrease in a level of activity of the β_3 -AR
6 *trans*-activating factor.

1 34. A method according to claim 33, wherein the decrease in the level
2 of activity of the β_3 -AR *trans*-activating factor is detected by detecting a decrease in the
3 level of expression of a reporter gene operatively associated with an isolated nucleic acid

4 having a nucleotide sequence GCCTCTGGGGAG (SEQ ID NO:1) relative to a level of
5 expression prior to contact with the test compound.

1 35. A method according to claim 33, wherein the decrease in the level
2 of activity of the β_3 -AR *trans*-activating factor is detected by detecting a decrease in the
3 amount of β_3 -AR *trans*-activating factor present in the cells after contacting them with the
4 test compound relative to the amount present prior to contact with the test compound.

1 36. A method according to claim 33, wherein the cells endogenously
2 express β_3 -AR.

1 37. A method according to claim 36, wherein the cells are selected
2 from the group consisting of neuroblastoma and BAT cells.